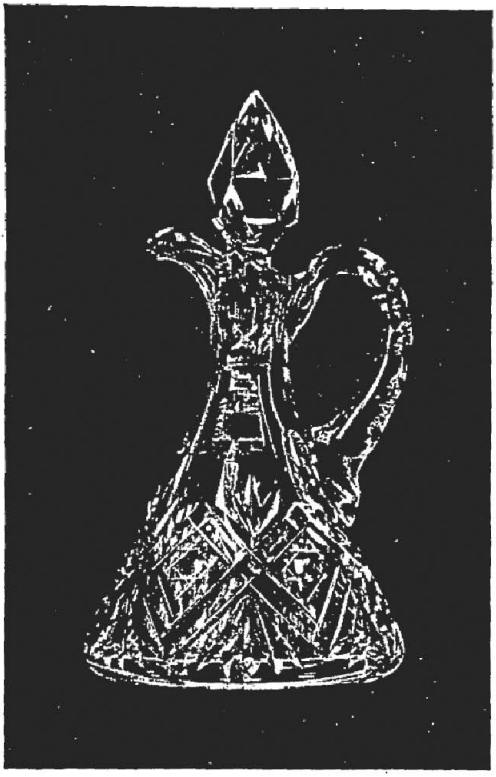
soda. The finer kinds of glass, made without lead, are called crown glass. But where glass of the finest quality for cutting and polishing is desired, oxide of lead must be used, and, in general, a better grade of sand and alkali. This is often called flint glass, as distinguished from the cheaper or lime glass. The flint glass is heavier, as well as more brilliant. The lime glass has a decidedly greenish tint. Lead, or flint glass, may also be recognized by the clear tone it gives forth when struck as a bell. If color is desired in flint glass, certain metallic oxides are mixed with the usual ingredients. The addition of oxide of copper gives a blue color, while oxide of iron imparts a yellow. Pure gold yields a ruby red.



Oil. "B."

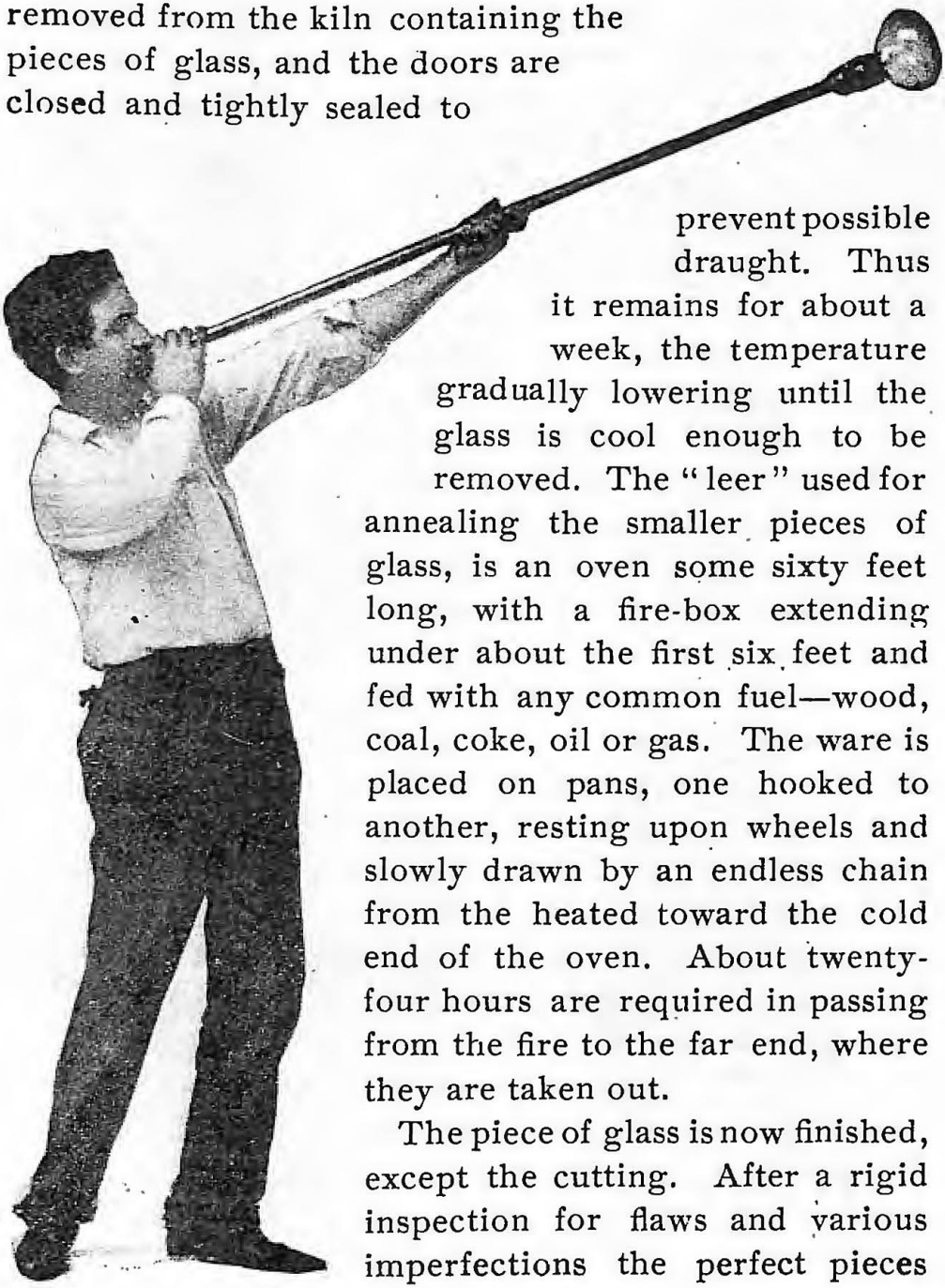
Only within recent years has our country produced materials of quality fine enough for the making of our present richly cut glass. To choose these wisely, to combine them judiciously, to melt them into the purest attainable metal, all requires unusual judgment and experience. At every

point important details are to be controlled. The materials carefully selected are accurately weighed and thoroughly mixed. The clay pot or crucible must be just so. The prepared batch is placed in this pot, and is gradually brought to the melting point (2500° Fahrenheit), after which it is allowed slowly to cool until sufficiently hard for the workman to "gather." The man who is designated as a "gatherer" inserts into the pot the end of an iron blowing tube and collects thereon a sufficient quantity of the molten glass or metal. Another workman then partially shapes the mass by blowing, and passes it on until it reaches the hands of the "gaffer" (or foreman), who gives he piece its final shape. This group of men working together under a gaffer is called a "shop."

To reduce its brittleness the piece must then be annealed. If heavy, it is placed in a kiln; if light, in a "leer" or oven. Protected against the slightest draught of air, which would at once crack it, the piece is gradually cooled allowing the molecules time to arrange themselves.

At the end of the day the fire of hard wood is

removed from the kiln containing the pieces of glass, and the doors are closed and tightly sealed to prevent possible draught. Thus it remains for about a week, the temperature gradually lowering until the glass is cool enough to be removed. The "leer" used for annealing the smaller pieces of glass, is an oven some sixty feet long, with a fire-box extending under about the first six feet and fed with any common fuel—wood, coal, coke, oil or gas. The ware is placed on pans, one hooked to another, resting upon wheels and slowly drawn by an endless chain from the heated toward the cold end of the oven. About twenty-four hours are required in passing from the fire to the far end, where they are taken out.



The piece of glass is now finished, except the cutting. After a rigid inspection for flaws and various imperfections the perfect pieces

Worcestershire Sauce Bottle. "Brunswick."

are put into the cutter's hands, going first to a "rougher," who marks the main outlines of the design on the outside of the plain smooth surface with a peculiar gummy, red fluid. Then the pattern is "roughed" in with iron wheels or discs kept moist with a constant dripping of sand and water. These iron wheels vary in diameter, thickness, and the shape of their edges, according to the pattern to be cut. Indeed, wheels of great variety are used not only in the roughing, but in the smoothing and polishing. Sometimes ten or a dozen wheels are needed in cutting a single piece of glass. The roughing being completed, the work is inspected by the foreman, and, if satisfactory,